Amendments to the Claims:

This listing of claims dated August 13, 2004 will replace all prior versions, and listings, of claims in this application:

Listing of Claims:

1 (amended). A method of correlating a signal comprising the steps of:

(a) selecting a plurality of samples of said signal;

(b) modifying a first butterfly transform with a first twiddle factor;

(c) transforming said samples with said modified first butterfly transform;

(d) modifying a second butterfly transform with a second twiddle factor;

(e) transforming an output ~~of said~~ of said first butterfly transform with said modified second butterfly transform;

(f) modifying a third butterfly transform with a third twiddle factor;

(g) transforming an output of said second butterfly transform with said modified third butterfly transform;

(h) selecting a largest output of said third butterfly transform; and

(i) repeating steps ([a] <u>b</u>) - (h) for a plurality of values of said first, said second, and said third twiddle factors.

2 (original). The method of claim 1 wherein a value of said first, said second and said third twiddle factors ~~are~~ is selected from a twiddle factor set comprising values 0, $\pi/8$, $\pi/4$, and $3\pi/8$.

3(original). The method of claim 1 wherein the step of selecting ~~a~~ the largest output of said third butterfly transform comprises the steps of:

(a) storing a first output of said third butterfly transform;

(b) comparing a second output of said third butterfly transform to said stored first output; and

(c) replacing said stored first output with said second output if said second output is larger than said stored first output.

4 (amended). A method of correlating a signal comprising the steps of:

(a) selecting a plurality of samples of said signal;

(b) modifying said samples with a function of a first twiddle factor;

(c) transforming said samples with a first butterfly transform;

(d) modifying an output of said first butterfly transform with a function of a second twiddle factor;

(e) transforming said modified first butterfly output with a second butterfly transform;

(f) modifying an output of said second butterfly transform with a function of a third twiddle factor;

(g) transforming said modified second butterfly output with a third butterfly transform;

(h) selecting a largest output of said third butterfly transform; and

(i) repeating steps ([a] b) - (h) for a plurality of values of said first, said second, and said third twiddle factors.

5(original). The method of claim 4 wherein a value of said first, said second and said third twiddle factors ~~are~~ is selected from a twiddle factor set comprising values 0, π/8, π/4, and 3π/8.

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6(original). The method of claim 4 wherein the step of selecting a largest output of said third butterfly transform comprises the steps of:

(a) storing a first output of said third butterfly transform;

(b) comparing a second output of said third butterfly transform to said stored first output; and

(c) replacing said stored first output with said second output if said second output is larger than said stored first output.

7(original). A correlator for a direct sequence spread spectrum signal comprising:

(a) a weighting device to modify a sample of said signal as a function of a first twiddle factor;

(b) a first butterfly processor transforming a pair of modified samples of said signal;

(c) a second weighting device to modify an output of said first butterfly processor as a function of a second twiddle factor;

(d) a second butterfly processor transforming said modified output of said first butterfly processor;

(e) a third weighting device to modify an output of said second butterfly processor as a function of a third twiddle factor;

(f) a third butterfly processor transforming said weighted output of said second butterfly processor;

(g) a largest modulus selector to identify a largest output of said third butterfly processor; and

(h) a twiddle factor indexer successively varying a value of at least one of said first, said second, and said third twiddle factors.

8(original). The apparatus of claim 7 wherein said twiddle factor indexer varies ~~a~~ the value of at least one of said first, said second and said third twiddle factors with one of a value selected from a twiddle factor set comprising values 0, π/8, π/4, and 3π/8.

9(original). The apparatus of claim 7 wherein said largest modulus selector comprises:

(a) a comparator for comparing a first and a second output of said third butterfly processor; and

(b) a register for storing a largest of said first and said second outputs of said third butterfly processor.

10(original). A correlator for a direct sequence spread spectrum signal comprising:

(a) a first butterfly processor transforming a pair of samples of said signal as a function of a first twiddle factor;

(b) a second butterfly processor transforming an output of said first butterfly processor as a function of a second twiddle factor;

(c) a third butterfly processor transforming an output of said second butterfly processor as a function of a third twiddle factor;

(d) a largest modulus selector to identify a largest output of said third butterfly processor; and

(e) a twiddle factor indexer varying in succession a value of at least one of said first, said second, and said third twiddle factors.

11(original). The apparatus of claim 10 wherein said twiddle factor indexer varies ~~a~~ the value of at least one of said first, said second and said third twiddle factors with one of a value selected from a twiddle factor set comprising values 0, π/8, π/4, and 3π/8.

12(original). The apparatus of claim 10 wherein said largest modulus selector comprises:

(a) a comparator for comparing a first and a second output of said third butterfly processor; and

(b) a register for storing a largest of said first and said second outputs of said third butterfly processor.

correlation process is repeated for the eight input samples. The eight input samples 202 are correlated for each of the 64 combinations of ψ_2 212, ψ_3 214, and ψ_4 216 produced by the values in the twiddle factor set. At the conclusion of each pass, the largest correlation produced by the pass is compared to the stored largest correlation and the larger of the two stored for the next pass. The largest correlation produced by the multiple passes is selected as received signal and used to select one of 256 subcodes which are mapped to estimate 12 bits of the information 218. DQPSK demodulation of the φ_1 phase parameter in the phase decoder 224 provides an estimation of another four bits of the information 220.

Referring to FIG. 10, an alternative construction for a correlator 250 for the extended data rate weights the samples at the input to the butterfly devices. Weighting element 252 ~~256~~ applies appropriate ψ_2 twiddle factor weighting to the inputs to the two chip butterfly processors 254. Likewise, weighting elements 256 and 258 apply ψ_3 weighting and ψ_4 weighting to the inputs to the four chip butterfly processors 260 and the eight chip butterfly processor 262, respectively. In other respects, the correlator 250 operates in the manner described for correlator 200. Weighting the inputs for the additional twiddle factor before application of the butterfly produces the same result as modifying the butterfly by application of the additional twiddle factor, but has the advantage that no change is required to the butterfly processor hardware from that used for the IEEE 802.11b higher data rate CCK correlators.

Correlation of the signals of the high data rate system can be performed by with the correlators 200 and 250 of the extended data rate system. Since the set S_0 is the set of possible phase parameter values for the high data rate system, setting ψ_2 212, ψ_3 214, and ψ_4 216 to zero and correlating the eight samples with a single pass through the extended data rate correlator 200 or 250 correlates the high data rate signal.

Utilizing the method and apparatus of the present invention, it is possible to correlate bandwidth efficient multilevel M-ary phase shift key modulated signals with a number of correlators suitable for less complex signals. As a result,